

REMARKS

Claims 1, 2, 4-9, 11-17, 19-22, and 24-35 are pending in this application. By this amendment, claims 5, 25 and 32 are amended merely for the purposes of expediting prosecution. Reconsideration in view of the following remarks is respectfully requested.

Applicants gratefully acknowledge the courtesies extended by Examiner Maldonado and Examiner Fourson on March 11, 2005 in a telephone interview. The substance of the telephone interview is incorporated herein and summarized below with respect to the 35 U.S.C. §103(a) rejections. Specifically, as agreed upon in the interview, Brooks et al. (U.S. Patent No. 5,786,276, hereinafter "Brooks") cannot be combined with Long et al. (U.S. Patent Application Publication 2003/0079983 A1, hereinafter "Long") for at least the reasons discussed in the interview and set forth below. Withdrawal of all pending rejections is hereby requested.

I. 35 U.S.C. §112

The Office Action rejects claims 5, 25, and 32 under 35 U.S.C. §112, second paragraph. While Applicants do not acquiesce to the rejection, Applicants have amended claims 5, 25 and 32 merely for the purposes of expediting prosecution. Withdrawal of the rejection is hereby requested.

II. 35 U.S.C. §103(a)

A. Applicants' submitted related art in view of Brooks, Luo and Long

The Office Action rejects claims 1, 2, 4-7, 9, 11-15, 17, 19-22, 24, 25, and 27-35 under 35 U.S.C. §103(a) over Applicants' submitted related art in view of Brooks, Luo et al. (U.S. Patent No. 6,793,835, hereinafter "Luo") and Long. During the interview, Examiners Maldonado and Fourson agreed that Brooks and Long are not combinable for at least the reasons included below, therefore the rejection is traversed and withdrawal of the rejection is requested.

As discussed in the interview, Brooks is directed to a remote microwave plasma used for chemical downstream etching. In the remote microwave plasma generator, remote plasma 160 is struck and fed with input gases consisting of: CH₃F or CH₂F₂, and CF₄ and O₂. The plasma afterglow 165 is flowed by exposed SiN and SiO or Si surfaces of the wafer 120 to provide selected removal of the SiN material. See column 6, lines 56-61. However, Brooks fails to disclose or suggest at least the feature of a dual frequency parallel plate plasma reactor having a showerhead electrode and a bottom electrode on which the substrate is supported, as well as other features of claim 1.

The Office Action alleges that it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Kadomura (Brooks as discussed in the interview) and Long to enable the etching process of the prior art in Kadomura (Brooks) in the etching reactor of Long and to provide better uniformity of the etch layer (Long). However, as also discussed in the interview, Long discloses the capacitively coupled plasma source having a plasma electrode

and a bias electrode, wherein electric field of uniformity can be adjusted to affect plasma uniformity and etch or deposition uniformity. See page 1, paragraph 10.

As discussed and agreed to in the interview, since Long discloses a different, non-interchangeable plasma source compared to the plasma source in Brooks, the references are not combinable and the rejection should be withdrawn. Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to combine the remote microwave plasma generator of Brooks et al. with the capacitively coupled generator of Long. Applicants submit such a combination would not result in the provision of better uniformity by Long because such provision is based on the use of a capacitively coupled plasma source, rather than a remote microwave source. Specifically, one of ordinary skill in the art would not adjust RF power coupled to a subelectrode of a capacitively coupled plasma source and expect the same functionality in a remote microwave plasma which does not include a showerhead electrode supplied with RF energy as discussed in the Interview.

Additionally, one of ordinary skill in the art would not have had a reasonable expectation of success in applying the chemical recipes used for chemical downstream etching in a remote microwave plasma generator to a capacitively coupled plasma source. As set forth in Brooks, the inflowing gases are dissociated into respective submolecular constituents by the microwave source and flowed toward exposed surfaces of the to-be-etched, remotely located, silicon nitride, wherein the free H and F particles flow downstream to react with the exposed surfaces. See Brooks column 7, line 48 through column 8, line 29. On the other hand, Long discloses gas injection orifices in communication with a gas inlet,

wherein processing gas is introduced via an inlet to be ionized into the form of plasma between the capacitively coupled plates. See page 7, paragraph [0088].

Therefore, as discussed in the interview, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to combine Brooks and Long; and if combined, one of ordinary skill in the art would lack a reasonable expectation of success in applying the chemical recipes for the remote plasma source from Brooks for the capacitively coupled plasma source of Long.

Similarly, with respect to claim 24, the combination of references do not render claim 24 obvious because claim 24 recites a combination of features including a parallel plate plasma reactor and an etching gas including CH₃F and O₂ supplied to the plasma etching reactor. As mentioned above and discussed in the interview, one of ordinary skill in the art would not have been motivated to combine Brooks and Long; and if combined, one of ordinary skill in the art would lack a reasonable expectation of success in applying the chemical recipes for the remote microwave plasma source from Brooks for the capacitively coupled plasma source of Long.

With respect to claim 29, similar to claims 1 and 24, Applicants submit that claim 29 is not obvious over the combination of references. This is because claim 29 recites a combination of features including a capacitively coupled plasma etching reactor with an etching gas including CH₃F and O₂ supplied to the plasma etching reactor and again the references fail to disclose or suggest this combination of features as discussed in the interview. Again, one of ordinary skill in the art would not have been motivated to combine Brooks and Long; and if combined, one of ordinary skill in the art would lack a reasonable expectation of success in applying

the chemical recipes for the remote microwave plasma source from Brooks for the capacitively coupled plasma source of Long.

Additionally, Luo does not facilitate combining Brooks with Long. Rather, Luo discloses a magnetically enhanced reactive ion etch (MERIE) chamber, which is not combinable with either the remote microwave plasma source of Brooks or the capacitively coupled plasma source of Long, let alone the combination of the three.

For at least the reasons set forth above and in the interview, Applicants respectfully submit that claims 1, 24, and 29 are allowable. Claims 2, 4-7, 9, 11-15, 17 and 19-22 depend from claim 1, claims 25 and 27-28 depend from claim 24 and claims 30-35 depend from claim 29, and are allowable for at least the same reasons. Withdrawal of the rejection is respectfully requested for the reasons set forth above and the reasons discussed in the interview, wherein withdrawal of the rejection was agreed upon.

B. Applicants' submitted related art in view of Brooks, Luo, and Hung

The Office Action also rejects claims 16 and 26 under 35 U.S.C. §103(a) over Applicants' submitted related art in view of Brooks, Luo, and Hung et al. (U.S. Patent No. 6,380,096, hereinafter "Hung"). During the interview, Examiners Maldonado and Fourson agreed that Brooks and Long are not combinable for at least the reasons set forth above, therefore the rejection is traversed and withdrawal of the rejection is requested. Also Applicants note that withdrawal of the rejection was agreed upon as Brooks is not combinable with any of the other cited references.

Applicants note that the Long reference is not used in this rejection per se. However, as to the discussion on the bottom of page 7 with respect to Kadomura

and Long, Applicants respectfully direct the Examiner's attention to the discussion above with respect to the Brooks and Long references.

As discussed above, Brooks discloses a remote microwave plasma apparatus. Luo discloses a magnetically enhanced reactive ion etch chamber (MERIE). Hung discloses an inductive plasma source (IPS) or other types of high-density plasma reactors, including remote plasma source (RPS) and electron-cyclotron resonance (ECR). See column 3, lines 22-42. None of these references discloses or suggests a dual frequency parallel plate plasma reactor as recited in claim 1, or a parallel plate plasma reactor as recited in claim 24.

Additionally, while Long discloses a capacitively coupled plasma source, Long is not combinable with Brooks, Luo or Hung, let alone all three references.

For at least the reasons set forth above, Applicants respectfully submit that claim 16 is allowable for at least the same reasons as claim 1 from which it depends, and claim 26 is allowable for at least the same reasons as claim 24, from which it depends. Withdrawal of the rejection is respectfully requested for the reasons set forth above and the reasons discussed in the interview.

CONCLUSION

On the basis of the foregoing, Applicants respectfully submit that claims 1, 2, 4-9, 11-17, 19-22, and 24-35 define patentable subject matter and should be passed to allowance. Allowance of this application is respectfully requested.

Furthermore, if the Examiner believes that a further discussion regarding this application would help advance prosecution he is invited to contact Applicants' representative at the telephone number listed below.

Respectfully submitted,

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